BOLL WEEVIL CONTROL

WITH

Syrup (or molasses) and Calcium Arsenate

Compiled by
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FOR FREE DISTRIBUTION

HOW TO CONTROL THE BOLL WEEVIL

SYRUP (OR MOLASSES) AND CALCIUM ARSENATE

or

DRY OR DUSTED CALCIUM ARSENATE

WHICH?

In undertaking this treatise on the boll weevil, I will endeavor to make it as full and comprehensive as possible.

My prime object is to bring about a standardization of syrup or molasses as a basis for applying calcium arsenate to control the weevil. With this accomplished it will be an easy matter to convince the cotton planter that this is the best method yet discovered for controlling this pest.

The first step is to place these facts before the people most interested and it will then be readily understood why all farmers do not secure the same results when demonstrating the syrup or molasses method.

I present to the readers of this paper, the opinions of the best authorities of the U. S. Government Entomological department and reprint the report as made by the chief U. S. station in the South at Tallulah, known as the Delta Laboratory, the highest authority on the boll weevil.

ORIGIN OF THE BOLL WEEVIL

The boll weevil originated in Mexico and has progressed northward until the infected area encompasses almost the entire cotton belt; the exception being parts of Oklahoma, Arkansas, Tennessee and North Carolina, where, as yet, the weevil has not become sufficiently acclimated to stand the rigors of winter. Even in the valleys of the most northernly cotton states, the weevil has done but little damage, except in certain localities.

HOW FAST BOLL WEEVILS MULTIPLY

Many a farmer excuses his indifference for the welfare of his crop by deluding himself into the belief that there are but few weevils in his growing crop, when the truth is that when his cotton is young and apparently a few weevils have appeared that it then is in the greatest danger. I will say as a basis of illustration, when he has five hundred weevils to the acre giving June 20 as the starting point, that by November 1 there would be many hundred millions per acre. According to Professor Hunter in Bulletin 512, page 12: "A conservative estimate of the possible progeny of a single pair of weevils during a season beginning June 20, and extending to November 4, is 12,755,100 weevils."

So, it can readily be seen according to this increase, by geometrical progression, that it is the last three crops of weevils that put the finishing touches of destruction on the prospects of the farmer who has fooled himself into believing that he alone is going to escape the ravages of the pest because he has "not sufficient weevils to hurt," but when two-thirds of his labor has been destroyed by them, and when it is too late, he awakens to realize that as a result of his procrastination and indifference he had lulled himself to sleep on a false premise.

Professor Coad, in his bulletin No. 731, July 19, 1918, page 15, says: "The weevils on emerging in the spring will always concentrate near the hibernation quarters in which they spent the preceding winter. They remain rather closely at these points until they have multiplied sufficiently to threaten a shortage of food supply" (by exhausting the squares). "For this reason a great part of the cotton is not seriously infected with weevils until some time after midseason and often not until August."

DESTROY THEM EARLY

I am spending my own money to bring the average cotton farmer to a realization of the fact that he is wasting ten times as much labor raising cotton upon which to feed boll weevils as it would take to destroy them in the early spring as they emerge from their winter quarters to begin their career of devastation.

UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF ENTOMOLOGY

Southern Field Crop
Insect Investigations

Delta Laboratory
Tallulah, Louisiana,
July 6, 1921.

THE EFFICACY OF POISONED MOLASSES MIXTURE FOR THE CONTROL OF THE COTTON BOLL WEEVIL

By B. R. Coad.

During the past few weeks there has been considerable interest in certain portions of the cotton belt relative to the possibility of poisoning the cotton boll weevil by using a mixture of molasses, calcium arsenate and water. Numerous inquiries have been recived concerning the efficacy of such a mixture and so many reports were noted of excellent results being secured in field use that it was deemed desirable to give the question rather serious consideration. No experiments had been conducted by the Department of Agriculture with this particular mixture but years ago numerous tests were conducted to determine the possibility of attracting weevils with a large number of sweets including molasses and the results were generally negative, although there were a few instances of a very slight degree of attraction being shown. In view of these results it had seemed useless to conduct any further tests along this line until the present interest developed.

The first series of tests consisted of cage studies comparing the weevil mortality on plants treated with the molasses mixture, plain dusted calcium arsenate and also unpoisoned check plants. Various concentrations and amounts of the molasses mixture were tested and the entire series was repeated five times. In all a total of 86 different cage tests, involving the use of about 1200 weevils, were included in these series. The first test conducted showed the average mortality produced by the molasses mixture to be exactly the same as that of dusted calcium arsenate. The second showed the dusted calcium arsenate to be superior, while the third series indicated about an equal superiority of the molasses mixture. The fourth test was slightly in favor of the dusted calcium arsenate while the fifth showed the two preparations to have about an equal degree of toxicity. **The average of the entire series showed the mortality in all cages treated with dusted calcium**

arsenate to be exactly the same as that in the cages treated with the molasses mixture.

Tests of different amounts of the molasses mixture and also variations in the distribution over the plant showed practically no relation between these variants and the resultant mortality. In other words, the weevil mortality was practically as great in the cage receiving the lightest doses as in those receiving the heaviest.

The next series of tests were conducted on more nearly a field basis. For the purpose of these tests five rows of cotton were treated with the molasses mixtures, the next five with dusted calcium arsenate and the next five left untreated as a check. These three conditions were repeated three times in each experiment, thus making a total of 15 rows receiving each type of treatment in each test. The entire test was repeated four times under different field conditions. After the treatment these rows were examined carefully once a day for three days and the number of live weevils found on each row was carefully noted. The first series showed a very definite control reaction for the molasses mixture and indicated that much benefit had been derived from the application. Of the remaining three series, however, two showed more mortality in the rows treated with calcium arsenate than in those treated with the molasses mixture. In the four series as a whole there is no striking difference between the different treatments.

To secure a still further check from this subject a series of field plat tests were started, uniform cuts being surveyed, divided in half and one-half treated with dusted calcium arsenate while the other was treated with the molasses mixture. These tests are still under way but the results to date are of interest. The central 10 rows in each plat have been examined daily and the number of live weevils found on them carefully noted, as well as the percentage of squares punctured. To date we have found no definite difference in the square infestation and the record of live weevils collected shows almost three times as many found on the plats treated with molasses as on those treated with dusted calcium arsenate.

Considering these records as a whole it is seen that the molasses mixture does exercise a certain degree of control over the boll weevil but that this is generally less than that secured with plain dusted calcium arsenate. Under certain conditions it was found that a much better degree of control was secured from the molasses mixture than with calcium arsenate, but this result was noted only in the case of very small cotton plants averaging only a few inches in height, and also only during exceedingly dry weather. The latter fact was particularly

noticeable and is probably the key-note of the variation in results.

It seems quite probable that during exceedingly dry weather the weevils visit the droplets of molasses-water mixture for the purpose of securing moisture but do not follow this practice to as marked a degree during normal weather. In other words, the results so far indicate that dusted calcium arsenate is superior to the molasses mixture except during exceedingly dry weather and on very small plants. At the present time the growth of the cotton plants has apparently reached the point where the molasses mixture does not give any marked degree of control. Our fairly large scale applications on an acreage basis showed that it takes at least one hour and a half to treat one acre of small cotton with the molasses mixture and this would make the labor cost of the application somewhat greater than that involved in applying the plain dust. In view of such results there seems to be little reason for using the molasses mixture in preference to plain calcium arsenate at any time and it certainly should not be used on the cotton plants after they reach the squaring stage.

EDITOR'S NOTE—

I regard the cage test of Professor Coad to be a fair one as to the syrup (or molasses) and calcium mixture, inasmuch that it proves the local attracting power of syrup (or molasses) and calcium arsenate and that it did kill the weevils by their hunting for it, and eating it, but in the case of the dusted calcium arsenate it stands to reason that if weevils are confined to a cage and this confined atmosphere is in a measure surcharged with calcium arsenate that there would be a small chance of escape from its deadly effects and that even though the weevil did not eat this dry or dusted calcium arsenate, the still atmosphere being thus surcharged with the deadly poison, there could be no other result reasonable except to kill him. I cannot agree with the comparative reports of the paper of Professor Coad as proving that dry or dusted calcium arsenate is anything like as effectual as syrup (or molasses) and calcium arsenate processes, when the proper kind of syrup (or molasses) is used with calcium arsenate.

That these points might be cleared up to my satisfaction, I addressed the following letter to Professor Coad:

Ensley High School,
Ensley, Alabama,
September 20, 1921.

Professor B. R. Coad,
Tallulah, La.

Dear Sir:

I have read with much satisfaction your paper of July 6, 1921, on the use of syrup or molasses and calcium arsenate for controlling the boll weevil, and note your suggestion that the syrup or molasses mixture is more efficacious when applied to young cotton and when the plant is small.

Will you please give me the exact formula of the syrup mixture you used in the cage tests. I do not regard the field tests as being of any great importance since only a portion of a patch of cotton was used for the demonstrations as it is my opinion that a fair field test could not be made except that it had been applied to the entire patch or cut of cotton and this cut completely isolated from any other cotton.

In applying the dusted calcium arsenate in the cage tests, were the cages closed practically air tight, or were they sufficiently open to prevent the surcharging of the atmosphere with the dusted calcium arsenate?

I do not write this in a spirit of criticism, but to gain information upon which to base my own conclusions as to the relative value of the two methods of applying the calcium arsenate for weevil destruction.

It is my opinion that your valuable paper of July 6, 1921, should have wide circulation so that the cotton planter might be prepared to apply the syrup and calcium arsenate early next summer, while the cotton is small (the atmosphere generally being dry at that period of the year) and destroy the first crop of weevils as they emerge from hibernation.

I note also at the close of your paper of July 6, 1921, that you use the language "It certainly should not be used on the cotton plants after they reach the squaring stage." (Meaning the molasses and calcium arsenate mixture.) Will you please explain what is meant by this paragraph and from whence you draw your conclusions, etc.?

Thanking you for a reply at your earliest convenience, I am

Yours very truly,
WM. J. MIMS,
c/o Ensley High School, Ensley, Alabam

To this letter I received the following reply:

Tallulah, La., Sept. 24, 1921.

Mr. Wm. J. Mims,
Ensley High School,
Ensley, Ala.
Dear Sir:—

We have your letter of the twentieth and answering your inquiries chronologically will say, first, that the formula of the syrup mixture used in the cage test to which you refer was as follows:

½ gal. water.
2 lbs. calcium arsenate.
1 gal. molasses.

Second, in applying the dust (**calcium arsenate**) in these cage tests, would say that they were not enclosed at all, the calcium arsenate being applied with a duster (hand gun) in the same manner as to the cotton plant in our field tests.

Third, concerning the admonition contained in the last paragraph of circular dated July 6th, 1921, our conclusions were based upon the actual results obtained in these tests; that is to say, after the plant reached the squaring stage it was noticeable that the molasses mixture lost its control of the weevil.

Very truly yours,

GEO. A. MALONEY,
In Charge Advisory Division,
Delta Laboratory.

SOLUTION TOO BITTER

The mixture according to the above formula was entirely too strong. Such excess of calcium arsenate makes a solution that repels the boll weeil instead of attracting him. He would not eat or drink anything quite so bitter except in case of great hunger or thirst. According to the best reports I have received from successful experiments this solution contains about three times as much poison as it should in order to be most effective.

WHEN TO APPLY

When the cotton is from ten to twenty-four inches high and the squares are just beginning to form is the time when it is first attacked by the weevil as he is then just coming out of his winter hiding place (hibernation), and will begin to lay the first eggs. When these eggs begin to hatch at the end of the first twenty-one-day period this is called the first crop of

weevils. If the first crop of weevils is destroyed, a second application will catch all which may have escaped the first application and also the young ones which may be hatched from the first few squares punctured. This will insure a fair cotton crop. Sometimes in extreme cases a third application would be necessary to insure a full cotton crop.

HOW TO APPLY

Make a small rag mop with a handle about sixteen or eighteen inches long, and apply poison to small cotton by a sweeping motion across the stalks. In large cotton make an upward stroke through the branches, endeavoring to get it under the leaves and on the tender parts of the stalks. One man can apply to two rows at a time about as fast as he can walk along between them. The poison does not have to be on both sides of the same stalk of cotton, although this would be better.

COST OF LABOR

The labor for applying the syrup and calcium arsenate cannot well be considered, since each planter must settle this problem for himself, but generally speaking, the cost of labor is not an item to be calculated in applying poisons to cotton, because the labor used is the same labor that made the crop and as the crop is practically "laid by" when the labor for applying is needed, it costs practically nothing; but the average negro tenant and share hand cannot be induced to handle the dusted calcium arsenate while no trouble whatsoever is experienced in getting them to apply syrup and calcium arsenate. This item alone is of sufficient importance to weigh heavily in favor of using syrup and calcium arsenate in preference to the arsenate in the dusted form, even if their efficacy were proven to be equal.

DIFFERENCE IN TIME TO APPLY

The syrup and calcium arsenate can be applied at any time of the day, while the dusted calcium should be applied in the late evenings, at night by moonlight, or in the early mornings, when the atmosphere is still and when the cotton plant is moist with dew. Thus, the cost of labor is in favor of the solution rather than the dust, to say nothing of the difference in the cost of an application per acre, and in the cost of the apparatus for applying.

HOW TO CONTROL THE WEEVIL

There are only two accepted theories as to the best

method of controlling the weevil. Both are to reduce the damage by reducing the number of weevils, as it is generally conceded to be practically impossible to eradicate the pest entirely, owing to his hibernating habits and rapid spread, as indicated in the foregoing paragraph on the origin and habits of the weevil.

DUSTED CALCIUM ARSENATE REPELLANT

The first method is to treat the cotton with calcium arsenate in the dust form; that is, to apply it as a powder to the plants. To apply it thus with any degree of success the work of putting it on the plants must be performed in the early morning, late in the afternoon or at night, when there is sufficient dew on the cotton to prevent the calcium arsenate in this light form from stifling those applying it. Also the atmosphere must be comparatively still as only a slight wind will drive it away and cause great waste.

The effect of this nature of applying calcium arsenate is to repel the weevils. Consequently many of them flee from the cotton patch being treated and hie themselves to the weeds. ditch banks, turning rows, or nearby woods, to remain until some merciful rain shall come and wash away the calcium arsenate from the cotton stalks, leaves and squares, so that they may return to their natural breeding ground, the cotton square and boll.

SYRUP AND CALCIUM ARSENATE AN ATTRACTION

The other method of applying calcium arsenate is to mix it with syrup or molasses. This kind of mixture can be applied at any time, day or night, and by applying it under the leaves and along the tender parts of the stalks, it does not repel the weevils, but on the contrary it attracts them and at the same time it also attracts those that may be in the weeds along the ditch banks, turning rows, or nearby weeds, and they too are exterminated as rapidly as they are attracted.

RELATIVE COST OF THE TWO METHODS

Analyzing the two methods it is easy for the cotton planter to decide in favor of syrup (or molasses) and calcium arsenate. In another paragraph I have shown that the relative cost of labor for applying by either of the methods is practically the same, but the cost in material is greatly in favor of using the syrup or molasses mixture. The cost of material per acre for three applications in one season is approximately as follows: syrup (or molasses) and calcium arsenate, $1.20;

calcium arsenate in dusted form, $4.75; making a difference of $3.55 in favor of syrup (or molasses) and calcium arsenate—or sufficient to pay all the cost of labor for the three applications of syrup and calcium arsenate.

The syrup or molasses method needs no machine for spraying, hence the cost of machines for putting on the dusted calcium arsenate must be taken into consideration and this cost to the small farmer is no little item. But as I have before stated, the cotton farmers can figure out their own labor problems, since no two of them in any community are likely to be similarly situated as to the labor making the cotton and as to its relative control when needed.

SAVE THE BOTTOM CROP

Professor Hunter, in "Boll Weevil Problem," Bulletin No. 512, page 25, says: "They are unable to breed until squares are put on by the plants.

"Under usual conditions they will multiply until the crop, put on after a certain date, will all be destroyed. This, however, is of no importance **since a top crop in weevil regions is entirely out of the question."**

Here is conclusive evidence that if the weevil is destroyed as he emerges from winter quarters where he lies dormant throughout the winter months that the bottom cotton crop will be saved. Indeed it is my opinion that three applications will save the entire crop if properly and systematically applied and if a good uniform grade of both molasses and calcium arsenate are employed.

SORGHUM MOLASSES

Sorghum molasses should not be used under any circumstances, nor should syrups containing certain acid elements be used. The highest grade of syrup usually produced from seedless sugar cane will accomplish good results when new, but the using of old syrups should be avoided. The musty smell and taste of re-boiled or old syrups are not attractive to the weevils and should not be used. Any comparatively new uniform molasses will accomplish the desired results if properly applied.

CAUSE OF FAILURE

The failure of many of the tests and demonstrations made of syrup and molasses is to be laid to the inferior or adulterated calcium arsenate and many failures can also be attributed to old musty syrup or molasses and to using sorghum. I believe that some way will be found to standardize the syrups or

molasses and calcium arsenate and thus insure the experiments that are made to all be upon the same basis. But even then the indifference of some farmers and the differences in judgment of others as to the proper time to apply will bring about various results from the same mixture. The using of inferior syrups (or molasses) and calcium arsenate has caused enough failures in demonstrations to entirely discredit this method with many people. When a standard is adopted for both the calcium arsenate and the syrup used, I believe that the boll weevil will be as quickly eradicated as was the army worm.

TIME TO APPLY SYRUP MIXTURE

As already stated syrup and calcium arsenate as a weevil exterminator has passed the experimental stages. If it is applied in the **early spring** as before directed it is an easy matter to save a cotton crop. Do not wait to find if you have weevils, for if they were with you this season they will be with you next, even in greater numbers.

BOLL WEEVIL—BOLL WORM

Entomologists generally agree that the boll weevil does not do all the damage to fully matured bolls, but the boll worm, which is an entirely different species of pest, creates much of the havoc to full grown bolls and has done so for many years; but by growing a stock of corn about every twelve feet each way, in the cotton, this worm which has much more of a liking for corn than for cotton, will be attracted from the cotton and his damage can be almost entirely overcome.

Do not confuse the boll weevil with the boll worm, for the former is not so easily controlled, but according to Professor Hunter (Bulletin 512, page 11), the boll weevil will attack bolls after the supply of squares has been exhausted and do great damage. (Bulletin No. 731, page 9, by Professor B. R. Coad.)

CONCERT OF ACTION

As the boll weevil travels about fifty miles each year it can be readily seen that the effort to control must be uniform and general in scope. If not, then the cotton planter must go through the same processes of applying the syrup and calcium arsenate every spring while the cotton is young, using at least three applications in all for each year. But by concert of action all over the cotton belt it is my belief that the weevil would soon become as the once destructive army worm is considered today, a mere item in history.

DO NOT FOOL YOURSELF

It matters not if you rotate your crop from corn to cotton. Roots of corn stalks form a great hibernating base for weevils. Large weeds, pines, and other trees, furnish shelter for them during the rigors of winter. They can fly for miles before a brisk wind. It is easy for them to make a flight of several hundred feet every few minutes, so do not be lulled into inactivity and slack defense by supposing that the weevil may not visit your cotton next year. The worst crime any man can commit against himself is "to fool himself" at any time about anything. The farmer who does not study up on the weevils and make a close study of how to destroy them, is doing himself a gross injustice and in fact is working hard only to give them seventy-five per cent of the labor and cost of making his crop of cotton.

WANT OF THOROUGH STUDY

It is my opinion that the cotton farmer has never given the matter of using syrup and molasses as a base for applying calcium arsenate the careful consideration that it deserves, and the object of this pamphlet is to enable him to form his own conclusions as to why syrup (or molasses) and calcium arsenate has not come into general use. (The answer being the use of the wrong kind of syrup and molasses and of adulterated or worthless calcium arsenate.) I feel sure that after a careful perusal of these pages that every cotton farmer in the South will enter into a concert of action to control the weevil the coming season through the use of syrup (or molasses) and calcium arsenate, and by cleaning up all ditch banks and turning rows and burning them off in the early spring.

I stand ready at all times to help those who wish to help themselves and to answer any questions to the best of my ability.

That I champion the use of the molasses or syrup methods of using calcium arsenate to control the boll weevil and am expending a part of my salary, to place the facts as I see them, before the people of our Southland, is sufficient evidence of the great interest that I take in this subject which I believe means so much to every man dependent upon cotton for his daily bread. This includes the banker, the planter, the merchant, the small farmer, and every one who is depending upon the success of the cotton crop.

I have no syrup, molasses, nor machinery to apply dusted calcium arsenate for sale and am not interested in the sales of

any of them. Hence, hoped-for sales profits from these items cannot influence my argument.

I want an acknowledgment from every reader of this treatise showing that you have read and carefully studied the facts presented herein. Also opinions and suggestions, and especially your experiences with any method of combating the boll weevil are earnestly desired. They will be of great help to me in my warfare against this enemy.

Yours for service in Dixie,

WM. J. MIMS,
Professor of Mathematics, Ensley High School,
Ensley, Alabama.

N. B.—In compiling this treatise, I have gained much information from the following: Bulletin 731 by Professor B. R. Coad; Bulletin No. 139 by Professor R. W. Harned; "Boll Weevil Problem" by Professor W. D. Hunter; Bulletin No. 512; D. A. Bulletin 832; and many other helps from the department of Entomology; and from numerous reports of farmers who have tried out the syrup and calcium arsenate mixture.

ADDENDA

Page 9, under head of "WHEN TO APPLY," says: "When the cotton is from ten to twenty-four inches high," which is about right in extremely rich soils, but for uplands and ordinary soils the plant should be from about six to ten inches high, at first application, depending upon the formation of young squares.

Page 11, in "SYRUP AND CALCIUM ARSENATE AN ATTRACTION," the writer had in mind results obtained by certain experiments with a compound called "Weevilnip," which is used very much like the syrup and calcium arsenate mixture. In fact "Weevilnip" is a patented formula which is mixed with the syrup and calcium arsenate. The syrup and calcium arsenate alone will attract the weevils only a few feet, but any attractive poison is much better than a repelling poison.

—WM. J. MIMS.